(No Model.)

2 Sheets—Sheet 1.

J. S. BRIGGS.

CAR STARTER.

No. 316,730. Patented Apr. 28, 1885.

Fig. 1.

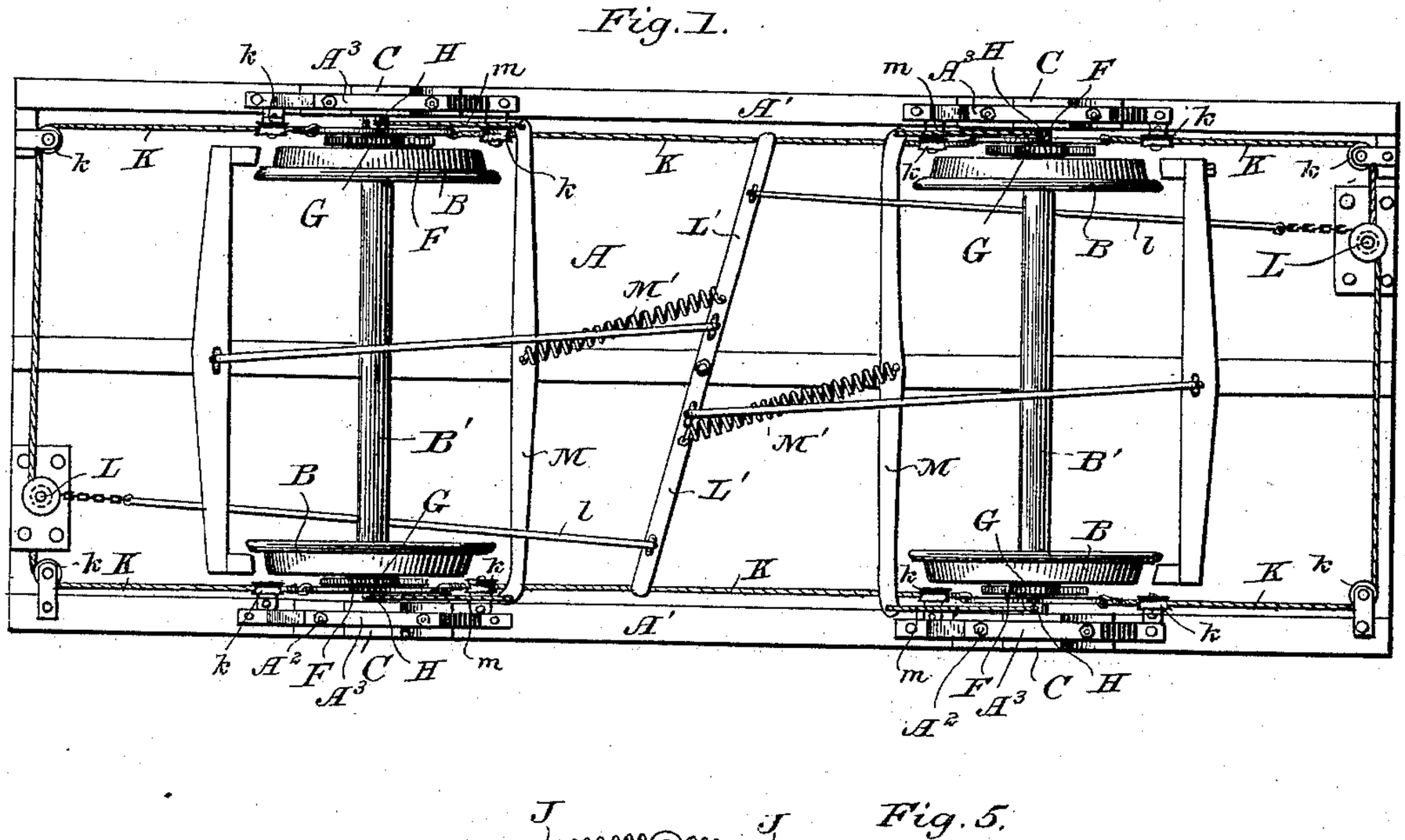

Fig. 5.

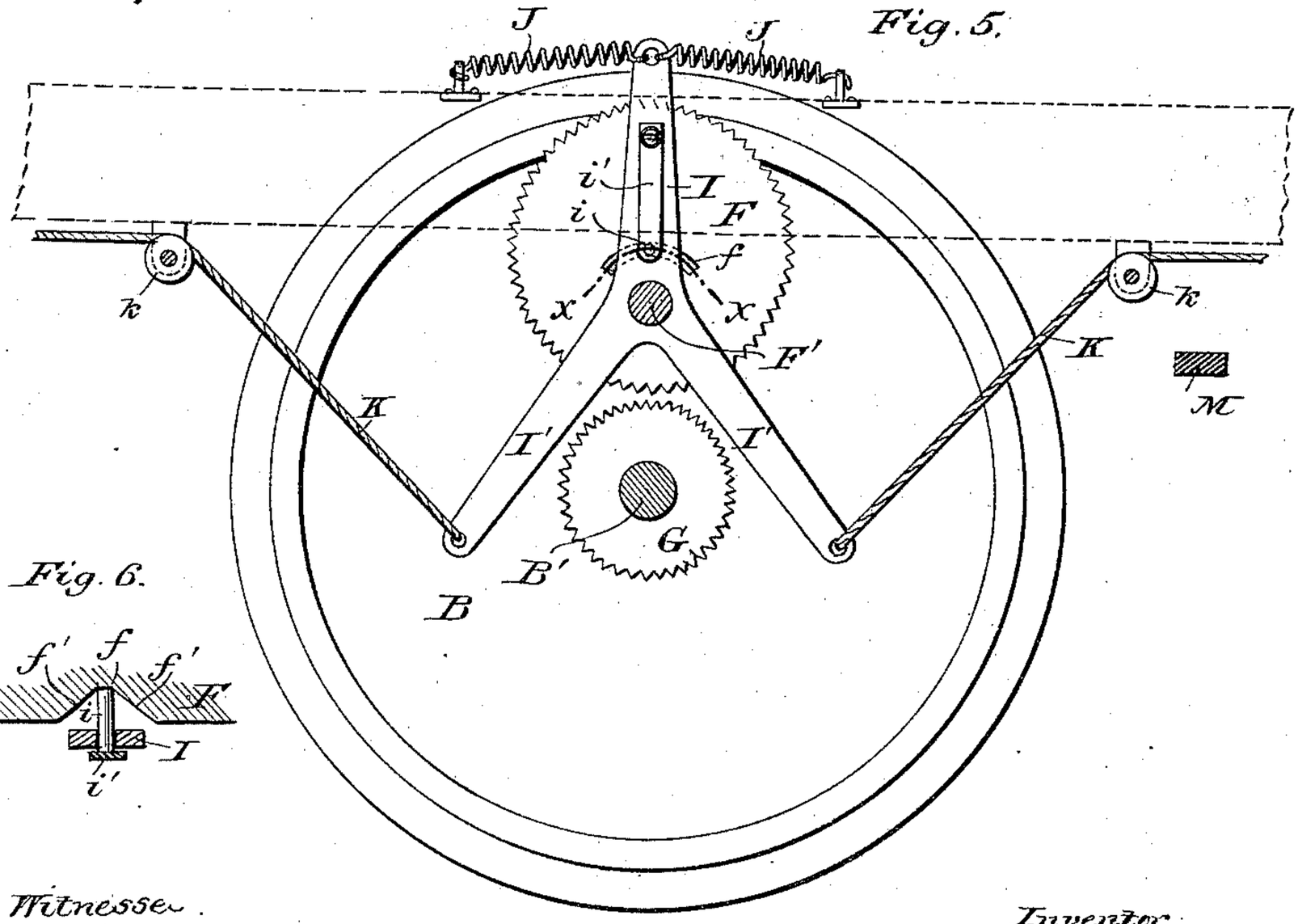

Fig. 6.

Witnesses.
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(No Model.)

2 Sheets—Sheet 2

J. S. BRIGGS.

CAR STARTER.

No. 316,730. Patented Apr. 28, 1885.

Fig. 2.

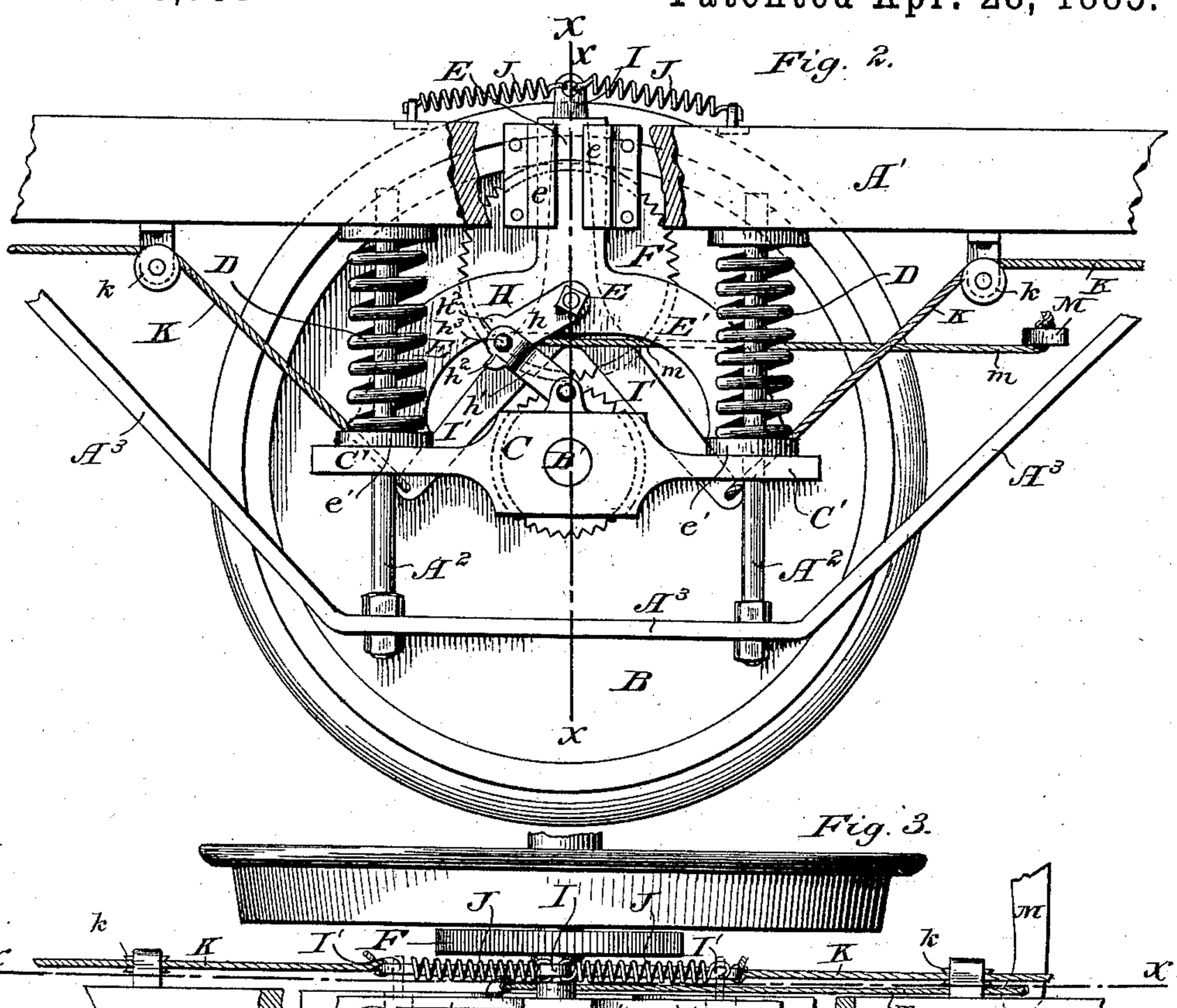
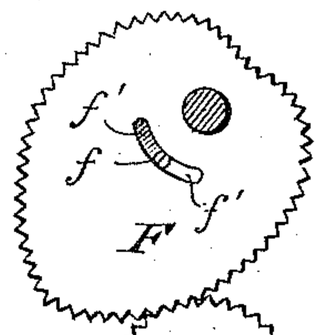


Fig. 3.

Fig. 8.



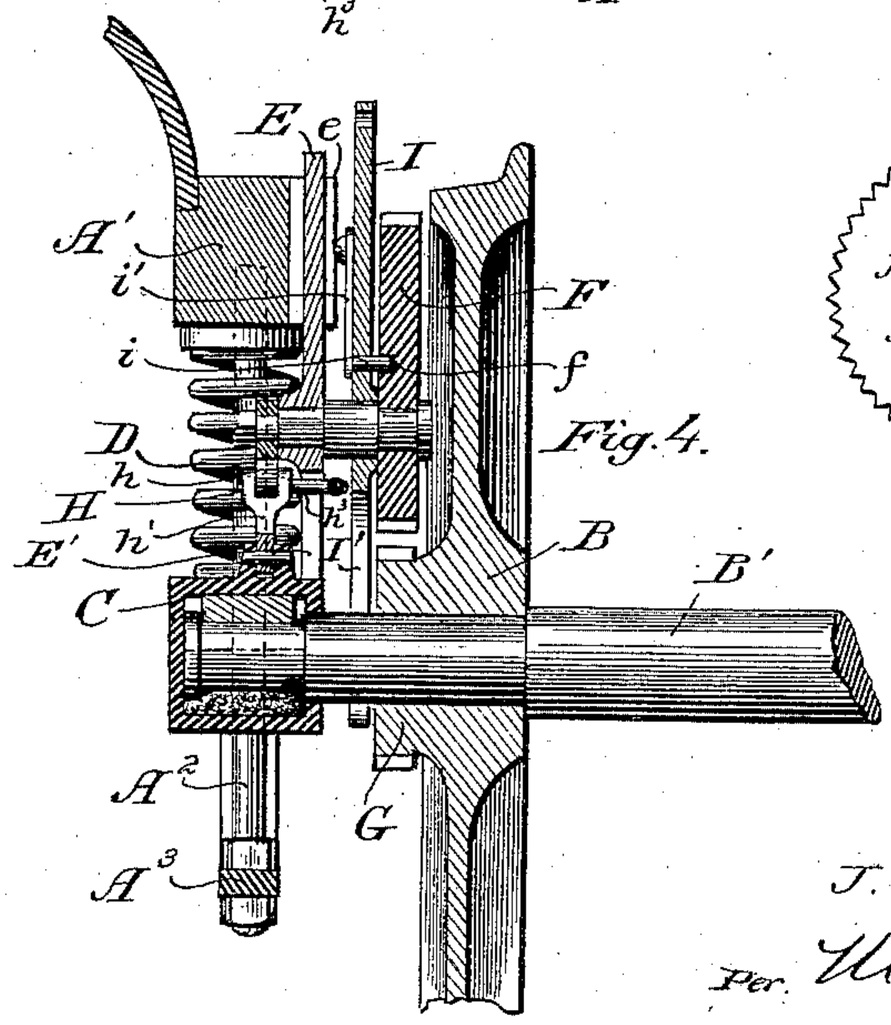
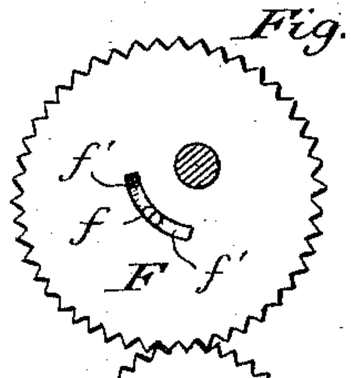


Fig. 4.

Fig. 7.



Witnesses:
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C. C. Poole

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Attorney

UNITED STATES PATENT OFFICE.

J. SMITH BRIGGS, OF KANKAKEE, ILLINOIS.

CAR-STARTER.

SPECIFICATION forming part of Letters Patent No. 316,730, dated April 28, 1885.

Application filed January 3, 1884. (No model.)

To all whom it may concern:

Be it known that I, J. SMITH BBIGGS, of Kankakee, in the county of Kankakee and State of Illinois, have invented certain new and useful Improvements in Car-Starters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in car-starters. Its object is to provide an improved construction in such devices, whereby, in the act of stopping the car, the force exerted in overcoming the impetus thereof may lift the car-body, so that the weight of the latter, operating in its descent, may be utilized as an auxiliary force in starting the car. To this end the invention consists in the matters hereinafter set forth, and pointed out in the claims.

In carrying out my invention devices are provided which are adapted to be placed in engagement with the wheels at the time of stopping the car, operating by the rotary movement of the wheels to lift the car-body to a point some distance above the position in which it is normally supported upon the springs and bearing-boxes of the car-axles, such devices being used in connection with means actuated by the descent of the car-body from the position to which it is raised, constructed to operate upon the car-wheels so as to give an initial rotary motion thereto at the time of starting the car. Means are also provided in connection with the devices described for temporarily supporting the car-body in its elevated position, such supporting devices being preferably constructed to automatically engage the car-body when the latter is lifted. Suitable connections are provided between the devices for upholding the car-body and a point upon the platform of the car or other place occupied by the driver or operator, so that such upholding device may be released and the weight of the car-body applied to rotate the wheels at a desired time, such connecting devices preferably being operated from the brake mechanism of the car, so that when the brakes are released at the time of starting the weight of the car-body will be thrown upon the operative parts and cause the initial rotation thereof at such time. Suitable means are also provided for causing the engagement of the car axles or wheels with the devices for lifting the car-body when it is desired to stop the car, such devices preferably being connected with and operated from the brake mechanism of the car, so that when the brakes are applied the lifting device will come into operation.

Any well-known means for converting rotary into rectilinear movement may be used for applying the rotary movement to the car-wheels to lift the car-body vertically.

In the device herein illustrated as one means of carrying out my invention one or more cams are pivotally supported upon the car-body above each car-axle, and in position to engage corresponding annular bearing-surfaces upon the wheels or axles. The said cams are of such shape and so located that when in one position they will be free from contact with said bearing-surfaces; but when partially rotated from such position their peripheries will be brought into contact with the said bearing-surfaces. The engagement of said cams with the bearing-surfaces during the rotation of the axles will cause a corresponding rotation of the cams, and the peripheries of the cams being curved gradually outward from their pivotal points the pivots of the cams will be thrown upwardly from the wheel-axles by such rotation, and a consequent lifting of the car-body will be effected. The weight of the car in its descent may be applied to rotate the wheels by the use of a second series of cam-plates similar to those above described, and constructed to operate upon a second set of annular bearing-surfaces upon the wheel-axles; or, as herein shown, the cam-surfaces for lifting the car and those for rotating the car-wheels by the descent of the car-body may be formed upon opposite sides of the same cam-plates and operate in connection with a single set of opposing bearing-surfaces. By this construction the cam-plates are caused to make a half-rotation in

lifting the car-body and a half-rotation in the descent of the car-body, the direction of rotation being the same in both cases. This construction also enables the same set of cams to be used with equal effect when the car is moving in either direction, the functions of the opposite sides of the cam-plates in lifting the car-body or rotating the wheels by the descent thereof being reversed in reversing the direction of motion of the car. When the car is started in a direction opposite that taken by it before its arrest, the same cam-surfaces that operated in stopping will also operate in starting it. The device herein provided for temporarily supporting the car-body when lifted until such time as it is desired to start the car preferably consists of toggle-arms pivoted, respectively, to the car-body and to the bearing-boxes of the axles, and constructed to uphold the said body from the boxes when the arms of the toggle are in alignment. The toggle-arms are operated to permit the descent of the car by means of suitable connection with the brake devices of the car, and means operated by the said brake devices for throwing the several cam-surfaces into engagement with the bearing-surfaces on the car-axles are also provided, as will be hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a plan view of the under side of a car, illustrating one form of my invention. Fig. 2 is a detail side view of a car-wheel and bearing-box and parts connected therewith. Fig. 3 is a sectional plan of the part shown in Fig. 2. Fig. 4 is a vertical section through the car-wheel and bearing-box, taken upon line *x x* of Fig. 2. Fig. 5 is a vertical section transverse to the axis of the car-wheel, taken upon line *x x* of Fig. 3. Fig. 6 is a detail section taken upon line *x x* of Fig. 5. Fig. 7 is a detail view of an eccentric and its opposing bearing-surface or pulley. Fig. 8 is a similar detail view of a cam.

A is the car-body, and A′ A′ are the lower longitudinal side beams thereof.

B indicates the car-wheel, and B′ the axles, which are rigidly secured thereto in the ordinary manner, and are constructed to run in bearing-boxes C, located exterior to the wheels, and which may be movably supported from the side beams, A′, in any desired manner.

As illustrated in the accompanying drawings, the boxes C are provided with apertured lateral projections C′, constructed to slide upon stationary vertical rods A^2, secured at their upper ends in the longitudinal side beams, A′, and held at their lower ends by being attached to brace-bars A^3, which connect the lower ends of the said rods, and are bent upwardly and attached to the said beams A′ at either side of the rods in a well-known manner. Springs of any usual or suitable construction may be placed between the bearing-boxes C and the car-body. As herein shown, however, spiral springs D are placed around the rods A^2, between the ends C′ of the bearing-boxes and the beams A′, and are constructed and operate in the usual manner to support the weight of the car from the said bearing-boxes and the wheel-axles.

Upon the car-frame, at points adjacent to and vertically above the axles B, are pivoted a series of cam-plates or cams, F, having their edges formed with two opposite cam-faces of similar curvature, and which, as shown in Figs. 1 to 7 of the drawings, are made, for convenience, circular in outline. The cams F may be pivotally attached in any desired manner upon the car-frame; but, as herein shown, they are supported upon pivot-pins F′, fixed in plates E, which are movably attached to the car-frame in a manner and for a purpose hereinafter set forth.

Upon the exterior face of each of the wheels B and opposed to the cams F are annular bearing-surfaces or pulleys G, preferably considerably smaller than the said cams, and formed, as herein shown, by extensions of the hubs of the wheels. The pivotal point of each cam F is so located with reference to the pulley G that it will, when in one position, be free from contact with the said circular bearing-surface, the parts, as shown, being so arranged that, when the said cam is placed with the portion of its periphery most distant from its pivotal point upward, it will be free from contact with the said bearing-surface or pulley, and when the said cam is turned slightly from the position described it will come into engagement with the said pulley.

Means are provided, as hereinafter more particularly described, for holding the cam in the position in which it is free from the pulley, and for rotating the said cam so as to bring its periphery into contact with the pulley G. The continued engagement of the said pulley and the cam during the forward movement of the car will obviously cause the rotation of the said cam and the consequent lifting of the car-body from the bearing-box upon which it is normally supported.

In Fig. 8 the cam F is shown as having a heart-shaped periphery. This cam operates substantially in the same manner as the circular form shown in the other figures, but possesses some advantages over such form, which will be hereinafter pointed out.

The meeting surfaces of the cam F and the pulley G are preferably toothed or serrated in order that the pulley may take a firm hold or grip upon the cam when they are brought in contact. The surfaces mentioned may, however, be smooth, slightly roughened, or may be covered by a band or layer of rubber, leather, or similar material, to increase friction and to prevent jar or injury to the parts.

For the purpose of temporarily retaining the car-body at the point to which it is lifted by the action of the cam F until it is desired to utilize its weight in starting the car, the plates E and the bearing-boxes C are each connected

by means of toggle-joints H, the two arms *h* and *h'* of which, when the car is lifted to its greatest height, will be vertically in line with each other and in position to prevent the descent of the car. Said arms are preferably provided with abutting stops h^2 at their central pivotal point, h^3, which operate to prevent said arms from going past the vertical line when the said toggle is straightened in lifting the car-body, and to thereby support the car-body in its raised position until the said arms are thrown out of alignment by extraneous force.

It will be seen from the construction described above that the movement of the car after the cams F have been brought into contact with the pulleys G will lift the car-body until the portion of the peripheries of the cams at the greatest distance from their pivots are in contact with the pulleys and the toggles H are straight. The continued movement of the car will then carry the cams past the points at which they support the car-body at its greatest elevation, so as to throw the weight of the car-body upon said toggles. As soon, however, as the weight of the car-body is thrown upon the toggles the cams will cease to turn, for the reason that their pivots will be held by the toggles at their greatest distance from the axles, and the periphery of the cam in its further rotation will pass out of contact with the pulleys G.

When the car-body is lifted in the manner above described by the action of the pulleys G upon the cams F, the said cams, in the continued rotation of the pulleys G after the car-body has been lifted to its highest point, will be carried slightly past the point at which their greatest radius is vertically below their pivotal points, so that when, by the release of the toggle-joints, the said cams are allowed to rest upon the pulleys G, and the weight of the car will tend to rotate the cam-plates, and thereby produce a corresponding rotation of the pulleys G and the car-axles.

In the device illustrating my invention herein shown the cams are moved for the purpose of throwing them into engagement with the pulleys G in stopping the car by means of a device operating from the brake mechanism, and means are also provided, operated by the brake mechanism, for holding the arms of the toggles H in alignment, such devices being so constructed that when the brake is released for the purpose of starting the car the toggles will flex and allow the car-body to fall, so as to permit the cams F to come in contact with the pulleys G. The stops h^2 are preferably so arranged that the arms *h* and *h'* will not come exactly in line, but will remain at a slight inclination, so that a slight pressure will hold them in position to support the car-body, and upon the pressure being removed they will become flexed and permit the car to descend.

The device for rotating the cams so as to bring them into engagement with the pulleys G, as herein illustrated and as preferably constructed, is made as follows: Upon the pivot-pin F' of the cam F is pivoted an upwardly-extending arm, I, which is held normally in a vertical position by a spring or springs constructed to permit said arm to yield in either direction. The said arm, as shown, extends above the cam, and is connected at its upper end with two coiled springs, J, secured to the car-frame at either side of the arm and constructed to hold it normally in a vertical position. Upon the said arm, a short distance from its pivotal point and projecting therefrom toward the face of the cam-plate F, is a sliding pin, *i*, said pin being constructed to yield longitudinally, and held at the outward limit of its movement by a suitable spring. As preferably constructed, the pin *i* is inserted in an aperture in the arm I, and the spring mentioned is in the form of a metal leaf-spring, *i'*, which is attached to the outer face of the arm I, and connected at one end with said arm and at the other end with said pin.

In the face of the cam F, and in line with its greatest radius, is formed an aperture, *f*, constructed to receive the inwardly-projecting end of the pin *i*. Said aperture, as shown more clearly in the detail, Fig. 6, is extended upon either side of the line mentioned in the arc of a circle concentric with the pivotal point of the cam, and has its bottom inclined outwardly from its central portion, so as to terminate at the exterior surface of the eccentric at either end of the aperture, as shown at *f'*, Fig. 6. The arm I being held in a perpendicular position by the springs J, as above described, the engagement of the pin *i* with the aperture *f* tends to retain the cam in position with its greatest radius vertical and upward, as illustrated in Fig. 5, the said cam when in such position being free from the wheel G, so that the car-axle may rotate without causing any movement of the cam. The movement of the arm I to the right or the left, when in the position shown in Fig. 5, will, however, by the engagement of the pin *i* with the recess *f*, cause the rotation of the cam, so that the periphery of the said cam may be brought into contact with the wheel G.

Any desired means may be used for operating the arm I in order to move the cam in the manner described at the time that it is desired to stop the car; but such movement of the arm is preferably accomplished by devices operated from the brake mechanism, so that when brakes are applied by the driver in stopping the car the arm I will be moved; or in case no brakes are used, and the power required to lift the car is depended upon to bring it to a full stop, such devices may be operated by any suitable connections with the car-platform or driver's station.

In the construction in devices for operating the arm I from the brake devices herein illustrated, two inclined arms, I', are attached to the arm I at or near its pivotal point, which arms extend downwardly upon either side of

the axle B′ and are connected at their ends with ropes or chains K, which are trained over suitable pulleys, *k*, upon the bottom of the car, and extend to the vertical brake-shafts L, to which they may be attached and operated in a manner similar to the ordinary brake-chains. The ropes or chains K are preferably extended, as shown, from the arms I′ to the brake-shafts at both ends of the car, so that the arm I will be rotated in one direction when the car is going one way and in the opposite direction when the car is going the other way, the brake-shaft at the front of the car always being the one which is operated.

As herein shown, and as more clearly illustrated in Fig. 1, the two adjacent arms I′ of the mechanism belonging to the two wheels upon the same side of the car are connected by a single chain, K, and motion is transmitted from the end of the car which is in advance to the rearmost arm I through the arms I′, connected with the starting mechanism of the forward wheel, thus rendering unnecessary the use of separate chains from the devices at each wheel to the brake-shaft.

As herein shown, and as preferably constructed, the toggles H are operated by means of transverse bars M, connected at their ends with the center pins, h^3, of the toggles by means of ropes or chains *m*, and having a spring-connection at the central portion with the brake device, so that the application of the brakes in stopping the car will draw the bars M backwardly and keep the said toggle rigid until the brakes are released.

As shown in the accompanying drawings, the bars M are connected at their central portions with the brake-lever L′ by means of springs M′, the said brake-lever being connected with the brake-shafts L by means of rods *l* in the usual manner.

In stopping the car, the cams F are moved by the brake mechanism before the car is lifted, and it is therefore evident that the toggle H will not be straightened out until after strain has been put upon the bars M by a movement of the brake-levers. For this reason a spring-connection is made between the said levers and the said bars, so that the brake-levers may be moved to the necessary extent before the car has been lifted sufficiently to permit the toggle to be straightened.

The toggles are, as before stated, constructed to bend or flex by the weight of the car, and the springs M′ are made of sufficient strength to hold the toggle-joint in position to support the weight of the car-body when it is raised, so that as long as there is a strain upon the springs M′ the toggles will be held rigid and the car supported; but upon the release of the brakes, and the consequent release of the springs, the car-body will be permitted to descend.

The springs referred to may obviously be placed at any desired point in the connections between the pivot-pins of the toggles and the brake-shafts L with the same result as above stated.

It is obvious that if the plate E, supporting the cams F, were rigidly attached to the car-frame, the weight of the car-body would be lifted from the springs D by the action of said cams, and during the time it is supported by the toggle H would rest directly upon the bearing-boxes C. This would be objectionable for the reason that the car may move forward after the car-body has been lifted; and it is therefore desirable that the car-body should be supported upon springs when so lifted in order to prevent jar thereto at such time. For this purpose the plate E is supported at its upper end in guides *e*, secured to the frame-pieces A′ in such manner that said plate may slide freely therein in a vertical direction. The said plate is also provided at its lower end with lateral projections or arms E′, terminating at their lower ends in horizontal forwardly-projecting portions *e*′, which encircle the rods A^2 beneath the springs D and rest upon the portions *e*′ of the bearing-boxes C when the car-body is in its normal position. By this construction the weight of the car is always supported upon the plate E; but as the parts *e*′ of such plates rest against the bearing-boxes when the devices described are not in operation, the said springs will act in their usual manner at the times mentioned. When, however, the car has been lifted by the action of the eccentric F and is thrown upon the toggle-joint, the plate E will be removed from contact with the bearing-box C, and the weight of the car will come upon said plate. The sliding connection of the part E^2 with the car-frame permitting the requisite movement of said plate when the car is lifted, as above described, also permits the requisite vertical play in the car which is necessary for the proper action of the springs.

Instead of making the cam F circular, as in in the devices described, it may be heart-shaped, as shown in Fig. 8, and before mentioned. The form of the periphery of such heart-shaped cam is preferably such that the effect of the downward pressure caused by the weight of the car-body in rotating the wheel is approximately the same at whatever point the pulley G is in contact with the cam, so that an equal force will be exerted by the car-body at all points during its descent.

An important feature of improvement embraced in my invention consists in the combination, with devices for lifting the car-body above its normal position, of means operating independently of the lifting devices for sustaining the car-body in its elevated position, whereby the car-body may be allowed to remain elevated until it is desired to utilize its weight in starting the car. As far as this feature of operation is concerned means other than the toggles herein shown may obviously be employed; and I do not desire to limit my invention to the use of such toggles for the

purpose mentioned, but desire to claim, broadly, all devices embracing the same general principles of construction and operation which are embodied in the mechanism herein illustrated.

I claim as my invention—

1. The combination, with a car-body and supporting-wheels therefor, of mechanism actuated by the rotation of the wheels in the forward motion of the car, constructed to lift the car-body above its normal position, toggles or equivalent supporting devices constructed to operate independently of the lifting mechanism for sustaining the car-body in its elevated position, means for releasing said supporting devices to permit the descent of the car, and mechanism operating by the downward movement of the car-body constructed to give an initial rotary motion to the car-wheels at the time of starting the car, substantially as and for the purpose set forth.

2. The combination, with a car-body and supporting-wheels or axles therefor provided with circular bearing-surfaces, and suitable bearing-boxes for the axles movably connected with the car-body, of cams pivoted to the car-body and adapted to engage said bearing-surfaces, means for partially rotating said cams to bring them into engagement with the said bearing-surfaces, toggles connected with the said bearing-boxes and with the car-body for supporting the latter in its elevated position, and means operating by the downward movement of the car-body in its descent, constructed to impart an initial rotary motion to the car-wheels, substantially as described.

3. The combination, with a car-body, supporting-wheels and axles therefor, and bearing-boxes for said axles, of cams F, pivoted to the car-body above the said axles, circular bearing-surfaces G upon the axles, arms I, pivoted concentrically with said cams, means upon said arms constructed to temporarily engage the cams, means constructed to actuate said arms so as to partially rotate the cams, and means connecting the car-body and the bearing-boxes, constructed to support the car temporarily in its elevated position, substantially as and for the purpose set forth.

4. The combination, with a car-body, supporting-wheels and axles therefor, bearing-boxes for the axles, and springs located between the car-body and the bearing-boxes, of circular bearing-surfaces upon the axles or wheels, plates E, constructed to slide upon the car-body and engaged with the lower ends of the springs, a cam, F, pivoted to the said plates E in position to engage the said bearing-surfaces, means connecting the said sliding plates with the bearing-boxes, constructed to temporarily support the car in its elevated position, means for holding the said cams free from engagement with the said bearing-surfaces, and means for rotating the cams so as to cause their engagement with the opposed bearing-surfaces, substantially as described.

5. The combination, with a car-body, supporting-wheels and axles therefor, and bearing-boxes for said axles, of cams F, pivoted to the car-body above said axles and provided with recesses *f*, circular bearing-surfaces upon the car-axles, arms I, pivoted upon the bearing-pins of the cams F, pins *i* upon the said arms, engaged with the recesses *f* in said cams, springs *i'*, constructed to hold said pins *i* in engagement with the said recesses, springs J, constructed to retain said arms normally in one position, means for operating the said arms so as to cause the engagement of the cams with the bearing-surfaces, and means connecting the car-body and the bearing-boxes constructed to temporarily support said car-body in its elevated position, substantially as described.

6. The combination, with a car-body, suitable supporting-wheels and axles therefor, and bearing-boxes for said axles, of cams F, pivoted to the car-body, annular bearing-surfaces G upon the car-axle opposed to said cams, toggles H, connecting said bearing-boxes with the car-body, and provided with stops h^3, constructed to hold the arms of said toggles in a slightly-flexed position, and means for temporarily holding said toggles in their extended position, substantially as and for the purpose set forth.

7. The combination, with a car-body, suitable supporting-wheels and axles therefor, and bearing-boxes for said axles, of cams F, pivoted to the car-body above the axles, annular bearing-surfaces G upon the axles opposed to the said cams, toggles H, joining the car-body and the bearing-boxes, means actuated by the brake mechanism of the car constructed to partially rotate the cams to hold said toggles in their extended position, and springs interposed in the connections between the toggles and the brake mechanism, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

J. SMITH BRIGGS.

Witnesses:

M. V. DAYTON,

OLIVER E. PAGIN.